Physical Science Assessment Statements - Dublin City Schools

Developed November 2013

These statements are not meant to be a sequence to be followed or to be taught in isolation. The only requirement is that the appropriate topics are taught during the correct semester.

1st Semester

1. **Motion**
   - 1.1 Basic Motion
   - 1.2 Motion Maps and Graphing
   - 1.3 Velocity
   - 1.4 Acceleration
2. **Forces**
   - 2.1 What is a Force?
   - 2.2 Types of Forces
   - 2.3 Newton's Laws of Motion
3. **Waves and Energy**
   - 3.1 Energy Conservation and Transfer
   - 3.2 Mechanical Energy
   - 3.3 Electrical Energy
   - 3.4 Work
   - 3.5 Wave Behavior
   - 3.6 Electromagnetic Spectrum

2nd Semester

4. **History of the Universe**
   - 4.1 Evidence for the Big Bang Theory
   - 4.2 Galaxy formation
   - 4.3 Stars
5. **Classification of Matter**
   - 5.1 Solutions & Mixtures
   - 5.2 Phase Change
   - 5.3 Density
6. **Atoms**
   - 6.1 History & Subatomic Particles
   - 6.2 Ions and Isotopes
7. **Periodic Table**
   - 7.1 Periodic Table
8. **Bonding**
   - 8.1 Types of Bonds
9. **Reactions of Matter**
   - 9.1 Types of Bonds
   - 9.2 Nuclear Reactions

1. MOTION

1.1 Basic Motion

	Assessment Statement	**Notes**
1.1.a	State that all motion depends on frame of reference.	There is no motionless frame of reference to judge all motion.
1.1.b	Define distance and displacement.	Change in position
1.1.c	Describe motion in terms of distance, displacement, position, speed, velocity, and acceleration.	

1.2 Motion maps and Graphing

	Assessment Statement	**Notes**
1.2.a	Interpret and draw motion maps.	
1.2.b	Describe motion in terms of distance, displacement, position, speed, velocity, and acceleration.	
1.2.c	Recognize constant velocity, rest, and acceleration on position-time graphs.	Understand the meaning of positive and negative slopes
1.2.d	Determine average velocity by using slope on a position-time graph.	
1.2.e	Create a velocity-time graph using a position-time graph.	
1.2.f	Recognize constant acceleration, rest, and constant velocity on a velocity-time graph.	Understand the meaning of positive and negative slopes
1.2.g	Determine average acceleration by using slope on a velocity-time graph	

1.3 Velocity

	Assessment Statement	**Notes**
1.3.a	Define velocity.	Rate of change of position
1.3.b	Define and compare instantaneous and constant speed/velocity.	
1.3.c	Calculate Average Velocity as displacement over elapsed time.	Units: m/s
1.3.d	Describe the difference between a positive and negative velocity.	
1.3.e	Describe the difference between speed and velocity.	Be able to provide examples

1.4 Acceleration

	Assessment Statement	**Notes**
1.4.a	Define acceleration.	Rate at which velocity changes.
1.4.b	Calculate average acceleration as change in velocity over elapsed time.	Units: m/s^2
1.4.d	Describe the difference between a positive and negative acceleration.	Avoid the term "deceleration"
1.4.e	Describe that zero acceleration can represent standing still OR moving at constant velocity.	

2. FORCES

2.1 What is a Force?

	Assessment Statement	**Notes**
2.1.a	Define the units for Force.	1 Newton will cause 1 kg to accelerate 1 m/s^2
2.1.b	Describe a force as an interaction between two objects.	

2.2 Types of Forces

	Assessment Statement	**Notes**
2.2.a	Identify the forces acting on an object.	Draw/identify the forces on a force diagram
2.2.b	Define normal forces.	Two solid objects pressed together at right angles from the surface
2.2.c	Define friction force, kinetic friction, and static friction.	Force opposing sliding between objects (only have to calculate if given a diagram)

2.3 Newton's Laws of Motion

	Assessment Statement	**Notes**
2.3.a	Define and apply Newton's 1^{st} Law (including the property of inertia).	An object accelerates only when acted upon by an unbalanced force.
2.3.b	Define and apply Newton's 2^{nd} Law.	$a = F_{net} / mass$

2.3.c	Define and apply Newton's 3rd Law.	ex. "A acts on B so B acts on A"

3. WAVES AND ENERGY

3.1 Energy Conservation and Transfer

	Assessment Statement	**Notes**
3.1.a	Identify that Joules is the unit of measure for energy.	
3.1.b	Define and apply the Law of Conservation of Energy.	
3.1.c	Identify and explain the energy transfer through conduction, convection, or radiation within a system.	

3.2 Mechanical Energy

	Assessment Statement	**Notes**
3.2.a	Calculate kinetic energy.	
3.2.b	Calculate gravitational potential energy.	

3.3 Electrical Energy

	Assessment Statement	**Notes**
3.3.a	Define electrical current and identify its units.	
3.3.b	Define voltage, identify its units, and how it relates to a battery.	
3.3.c	Define resistance and identify its units.	
3.3.d	Identify the relationship between current, voltage, and resistance.	No calculations (conceptual only)

3.4 Work

	Assessment Statement	**Notes**
3.4.a	Define work, both conceptually and algebraically.	Work = Force x displacement

3.5 Wave Behavior

	Assessment Statement	**Notes**
3.5.a	Describe how a wave will interact when it approaches a boundary/medium.	Reflection, refraction, diffraction, and absorption

3.5.b	Describe what happens when two waves meet.	Constructive vs. Destructive Interference
3.5.c	Describe how waves appear to an observer when the source of the waves is moving towards or away from the observer or the observer is moving towards or away from the source of the waves	Doppler Effect (frame of reference)

3.6 Electromagnetic Spectrum

	Assessment Statement	**Notes**
3.6.a	Distinguish between electromagnetic waves and mechanical waves.	
3.6.b	Identify and distinguish the different parts of the electromagnetic spectrum by wavelength, frequency, and energy.	

4. HISTORY OF THE UNIVERSE

4.1 Evidence for the Big Bang Theory

	Assessment Statement	**Notes**
4.1.a	Describe how Hubble's Law, red-shift, and cosmic background radiation provides evidence to support the Big Bang Theory.	
4.1.b	Describe how technology is used to collect and interpret data gathered in support of the Big Bang Theory.	Visual, radio, x-ray telescopes, and particle accelerators used to simulate early universe.

4.2 Galaxy formation

	Assessment Statement	**Notes**
4.2.a	Classify the different types of galaxies by size and shape.	Emphasis on the Milky Way galaxy and its anatomy.

4.3 Stars

	Assessment Statement	**Notes**
4.3.a	Describe the conditions necessary for the formation of stars and their evolution.	Including the reduction of nuclear reactions leading to a star's collapse.

4.3.b	Classify stars in terms of color, size, mass, and luminosity in reference to a Hertzprung-Russell diagram.	Strong emphasis on being able to read the H-R diagram.

5. CLASSIFICATION OF MATTER

5.1 Solutions & Mixtures

	Assessment Statement	**Notes**
5.1.a	Distinguish between a homogeneous and heterogeneous solution.	Emphasis on solutions and their parts.
5.1.b	Classify matter in terms of its chemical and physical properties.	Chemical: reactivity Physical: color, solubility, odor, hardness, density, melting pt., boiling pt. viscousity, malleablity

5.2 Phase Change

	Assessment Statement	**Notes**
5.2.a	Describe how molecular kinetic energy relates to states of matter.	Relate to heating/cooling curve.
5.2.b	Identify why the temperature does not increase during a phase change, in terms of potential and kinetic energy.	Relate to heating/cooling curve.

5.3 Density

	Assessment Statement	**Notes**
5.3.a	Define density and calculate density (algebraically).	
5.3.b	Calculate and interpret the density of a material on a Mass vs. Volume graph.	
5.3.c	Describe the relationship between density and the amount of thermal energy, in terms of particle motion and spacing.	

6. ATOMS

6.1 History & Subatomic Particles

	Assessment Statement	Notes
6.1.a	Describe Rutherford's experiment and its importance to the atomic model.	
6.1.b	Identify the subatomic particles and their mass, charge, and location in the atom.	

6.2 Isotopes & Ions

	Assessment Statement	Notes
6.2.a	Define atomic number and mass number.	
6.2.b	Define isotopes and ions (cation and anion).	
6.2.c	Identify an atom, isotope, or ion by the number of protons, neutrons, and electrons.	

7. PERIODIC TABLE

7.1 Periodic Table

	Assessment Statement	Notes
7.1.a	Describe how elements in the same group/family have similar physical and chemical properties.	
7.1.b	Distinguish between a metal, non-metal, and metalloid in terms of their physical and chemical properties.	
7.1.c	Identify metals, non-metals, metalloids, alkali metals, alkaline earth metals, halogens, and noble gases by the position on the periodic table.	Identify the element's position in terms of periods and groups/families.
7.1.d	Identify an elements ionic charge based on its position on the periodic table.	Groups 1, 2, 17, Oxygen, and Hydrogen (minimum)
7.1.e	Determine the number of valence electrons for an element.	

8. BONDING

8.1 Types of Bonds

	Assessment Statement	Notes
8.1.a	Distinguish the difference between an ionic and covalent bond and/or compound.	Covalent: Non-metal & Non-metal (sharing

		electrons) Ionic: Metal & Non-metal (transfer electrons)
8.1.b	Name an ionic or covalent compound given the chemical formula, and write the chemical formula given the name of the compound.	Greek prefixes up to 10

9. REACTIONS OF MATTER

9.1 Chemical Reactions

	Assessment Statement	**Notes**
9.1.a	Define the Conservation of Matter.	
9.1.b	Balance chemical reactions using coefficients.	
9.1.c	Identify the reactants and products in a chemical reactions.	
9.1.d	Define and identify if a chemical reaction is endothermic or exothermic.	

9.2 Nuclear Reactions

	Assessment Statement	**Notes**
9.2.a	Describe the forces that hold the nucleus together (i.e. the strong nuclear force and electrostatic forces).	
9.2.b	Describe what causes an unstable nucleus and thus radioactive decay.	
9.2.c	Identify medical uses of radioactive decay and radioactive isotopes.	Emphasis on the uses on cancer cells
9.2.d	Define half-life.	
9.2.e	Interpret a half-life graph.	
9.2.f	Distinguish the difference between fusion and fission.	
9.2.g	Describe the role of fusion in the formation of new elements in stars.	